4. Technological Intuitions

My approach to instrument-making did not begin with a blueprint or a target sound in mind. Instead, it began with an embodied engagement—with components and circuits that I had touched, tested, built, and broken. The technologies that shaped my thinking were not adopted for what they promised, but for how they behaved under my hands. Their unpredictability, tactility, and proximity to the body resonated with the kind of sonic space I wanted to create: open, participatory, and alive.

Many of these techniques were introduced to me through the teaching and writing of Nic Collins. During his workshop at Catalyst last semester, I hand-built a crackle box, soldered a contact microphone, and experimented with feedback loops—at first using traditional microphones in spatial setups, but later extending the idea to contact mics embedded within physical materials. Separately, through Collins' book *Handmade Electronic Music*, I became fascinated with the concept of the paper speaker[6], and spent considerable time exploring its design, sonic character, and limitations.

These four technologies—crackle box, contact mic, paper speaker, and feedback as physical system—formed the conceptual and practical backbone of my early experimentation. While not all were carried into the final instruments, they collectively shaped how I understood the relationship between sound, gesture, and materiality. Crucially, all of these methods are low-cost and DIY-friendly, aligning with the project's broader ethos of accessibility and reproducibility.

4.1 Crackle Box

The crackle box is a small, handheld electronic instrument that produces unpredictable noise through direct contact with the human body. It consists of a circuit housed in a box, with a built-in speaker and several exposed metal touchpoints. When fingers touch and bridge these contacts, they complete and disrupt the circuit simultaneously, resulting in screeches, pulses, and bursts of unstable feedback.

I first encountered this instrument in a workshop led by Nic Collins, where we built it from scratch using simple components, most notably the LM386 amplifier chip. What immediately struck me was the directness of its interface: there was no clear boundary between performer and machine—the body became part of the circuit. Slight differences in touch, moisture, or pressure generated completely different results.

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[6] A paper speaker is a simple speaker made from a lightweight diaphragm—typically paper or thin plastic—connected to a coil and magnet. It converts electrical signals into sound through vibration.

What appealed to me most was its openness, both technically and experientially. The circuit was simple enough to build without prior expertise, yet its sonic behavior resisted predictability. This balance—between accessibility and instability—made the crackle box not just a tool, but a conceptual anchor for thinking about sound as something emergent through contact and resistance.

4.2 Contact Microphone

The contact microphone is among the simplest and most versatile audio tools available. Constructed by soldering two wires onto a piezoelectric disc, it can be made in minutes and at very low cost. Once attached to the surface of a material, it captures vibrations transmitted through the solid body—converting them into electrical signals that can be amplified, recorded, or further processed.

Because of its light weight and sensitivity, the contact mic lends itself to a wide range of experimental and practical applications. When attached to acoustic instruments, it can function as a basic pickup system. But its real value lies in its ability to access sonic domains that traditional microphones cannot—such as underwater environments, enclosed spaces, or the internal resonance of objects. When insulated with resin or waterproof tape, it can be embedded in unexpected materials or used in less stable contexts.

This combination of affordability, accessibility, and exploratory potential makes the contact mic a core tool in many DIY and electroacoustic instrument-building practices. In the instruments developed for this project, it became both a sensor and a conceptual device—one that invites listening through matter, rather than air.

4.3 Paper Speaker

My engagement with the paper speaker began as a technical curiosity, but quickly became a way to re-examine the fundamentals of sound production. At its core, a speaker is a simple mechanism: a wire coil, a magnet, and a resonant surface. When an audio signal is sent through the coil, it generates a fluctuating magnetic field. Placed near a fixed magnet, this changing field creates a push-pull force that causes the coil to move. By attaching the coil to a sheet of paper or another flexible surface, these vibrations are transferred and amplified into audible sound.

What struck me was not only the minimalism of the mechanism, but how easily it could be reimagined. By varying the materials—paper, cardboard, plastic—or altering the shape and mounting of the resonant surface, one can drastically reshape the timbre, directionality, and spatial behavior of the sound. This opened up a new line of thinking: could the speaker itself

become part of the instrument’s body, rather than an external output device?This question, in turn, led me to explore transducer-based systems: mechanisms that convert electrical signals into physical vibration, transmitting sound through solid surfaces.

These explorations led me to transducer-based systems: mechanisms that convert electrical signals into physical vibration, transmitting sound through solid surfaces. This principle expanded my thinking beyond amplification—as a process of broadcasting—to a more intimate understanding of sound as embedded in, and shaped by, material structures. The speaker was no longer just an output device, but a collaborator in shaping sonic form.

4.4 Feedback as Physical System

Feedback—originally treated as an error or unwanted byproduct, particularly in live sound reinforcement contexts where microphone and speaker interactions can cause disruptive,—has become a generative resource in sound art. Artists now intentionally use no-input mixers or open-mic speaker loops to create evolving feedback systems, turning the acoustic properties of a space—its surfaces, reflections, and resonances—into a compositional element.

In recent years, these techniques have expanded beyond standard microphones. By feeding signal through contact mics, electromagnetic pickups, or even light-sensitive solar cells, feedback becomes not only spatial but material and environmental. It is no longer just a loop of sound, but a loop of context—one that exposes how sound reacts with the structures that host it. This approach, introduced to me during the workshop with Nic Collins, informed later aspects of my own instrument design.